

REMARKS

By this amendment, claims 2-7 have been cancelled, claim 1 has been amended, and claims 8-10 have been added. Thus, claims 1 and 8-10 are now active in the application. Reexamination and reconsideration of the application are respectfully requested.

The specification and abstract have been carefully reviewed and revised to make grammatical and idiomatic improvements in order to aid the Examiner in further consideration of the application. The amendments to the specification and abstract are incorporated in the attached substitute specification and abstract. No new matter has been added.

Attached hereto is a marked-up version of the changes made to the specification and Abstract by the current amendment. The attachment is captioned "Version with markings to show changes made."

On pages 2-4 of the Office Action, claims 1 and 4 were rejected under 35 U.S.C. 102(b) as being anticipated by Kuroyanagi et al. (U.S. 6,272,881); claims 2 and 6 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kuroyanagi in view of Farry, Jr. et al. (U.S. 5,409,056); and claims 3, 5 and 7 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kuroyanagi and/or Farry and further in view of Yamauchi et al. (U.S. 4,821,531). These rejections are believed moot in view of the amendments to claim 1. Furthermore, these rejections are believed clearly inapplicable to the now-presented claims 1 and 8-10, for the following reasons.

With exemplary reference to the drawing figures, amended claim 1 sets forth a heat exchanger 1 adopting a four-pass structure (Fig. 2), comprising: a plurality of tubes 2 disposed so as to distribute a coolant along a top-bottom direction over two rows to the front and rear along the direction of airflow (see Figs. 1(a), 1(c), 2 and 4(a)); a first upper tank portion 4a communicating with the upper end of a group of tubes 2a disposed in one of the tube rows; a second upper tank portion 4b communicating with the upper end of a group of tubes 2b disposed in the other tube row; a first lower tank portion 5a communicating with the lower end of the group of tubes 2a disposed in the one tube row; a second lower tank portion 5b communicating

with the lower end of the group of tubes 2b disposed in the other tube row; a communicating passage 4c that communicates between one end of the first upper tank portion 4a and one end of the second upper tank portion 4b; a partitioning member 8 partitioning the first upper tank portion 4a and the second upper tank portion 4b at substantial centers thereof; an inflow port 9 communicating with the other end of the first upper tank portion 4a, through which coolant from an outside source flows in; and an outflow port 10 communicating with the other end of the second upper tank portion 4b, through which coolant flows out to the outside; wherein the inflow port 9 has an opening area smaller than an opening area of the outflow port 10 (see Fig. 3); wherein a center of the opening area of the inflow port 9 is located at a position higher than a center of the opening area of the outflow port 10 (again, see Fig. 3); wherein the opening area of the inflow port 9 is within a range of 25 ~ 65 mm²; wherein an end plate 6 is fixed onto an end of the first upper tank portion 4a and an end of the second upper tank portion 4b; and wherein the inflow port 9 and the outflow port 10 are located at an outside of the end plate 6 so as to open outside of the heat exchanger 1.

In contrast, although the Kuroyanagi et al. patent discloses a heat exchanger including a plurality of tubes (2-5), upper tank portions (8, 10, 11 and 13), and lower tank portions (9 and 12), as well as an inflow port 6 and an outflow port 7, the Kuroyanagi et al. patent does not disclose or suggest that the inlet port opening is located higher than the outlet port opening nor that the inlet port opening has an area within a range of 25 ~ 65 mm², as recognized by the Examiner. Furthermore, the Kuroyanagi et al. patent clearly fails to disclose an end plate fixed onto an end of the upper tank portion, and that the inflow port and the outflow port are located at an outside of the end plate so as to open outside of the heat exchanger, as now required by claim 1.

The Examiner cited the Farry patent for disclosing (in Fig. 1) "a plate evaporator that has the inlet opening (28) located higher than the outlet opening (30) for a purpose of further moving the refrigerant from the inlet to the outlet under force of gravity." The Examiner also cited the Yamauchi patent for disclosing (in Figs. 2, 29-32 and at column 10, lines 16-23) "a plate

evaporator that has an inlet port opening of 7 mm in diameter [approximately 38 mm²] ... for a purpose of minimizing temperature deviation of air and flowing loss of the refrigerant."

However, the disclosure in Yamauchi at column 10, lines 16-23 is a disclosure of the diameter of a nozzle 300 (see Fig. 23), not an opening of an inlet port that is located at an outside of an end plate so as to open outside of the heat exchanger, as required by claim 1. Rather, in Yamauchi, the nozzle 300 is an internal nozzle disposed in the communicating hole 101 (see column 9, lines 18 and 19) in the inlet piping unit and the outlet piping unit "to propel refrigerant at the inlet tank portion 200 and the intermediate tank portion 201 to increase the amount of the liquid phase refrigerant which flows into the front portion of both tanks 200, 201 in the direction of the axis thereof so that the flow will not become insufficient. The amount of the liquid phase refrigerant is made sufficient by modulating the diameter and the length of the nozzle 300, 310." (See column 9, lines 57-66).

Thus, the area of the nozzle 300, although an important feature of the Yamauchi et al. structure, has no relevance to the opening area of an inlet port that is located at an outside of an end plate so as to open outside of the heat exchanger, as specifically required by claim 1.

Accordingly, because of the above clear differences between the present invention of claim 1 and the Kuroyanagi et al. patent, it is apparent that claim 1 is not anticipated by the Kuroyanagi et al. patent. Furthermore, for the above reasons, it is apparent that the features recited in now-amended claim 1 are not taught or suggested by any of the references of record. As such, a person having ordinary skill in the art would clearly not have found it obvious to modify the Kuroyanagi et al. arrangement or to make any combination of the references of record in such a manner as to result in or otherwise render obvious the present invention of claim 1. Therefore, it is respectfully submitted that claim 1, as well as claim 8 which depend therefrom, are clearly allowable over the prior art of record.

New independent claim 9 is similar to original dependent claim 4 in that it is directed to a refrigerating system configured to operate in accordance with a refrigerating cycle, wherein the refrigerating system comprises a variable capacity compressor and a heat exchanger. The heat

exchanger recited in claim 9 is required to include all of the features presented in claim 1. Therefore, it is respectfully submitted that claim 9, as well as claim 10 which depends therefrom, are clearly allowable over the prior art of record for the same reasons as presented above in support of claim 1.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is clearly in condition for allowance. An early notice thereof is earnestly solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, it is respectfully requested that the Examiner contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

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Submission of Replacement Formal Drawings

Submitted herewith are replacement drawings for Figs. 1, 2, 4 and 5, so as to provide separate figure labels for each of the Figs. 1(a), 1(b), 1(c), Figs. 4(a) and 4(b), and Figs. 5(a) and 5(b), in accordance with U.S. practice. We also corrected the left-most instance of reference numeral "22" in Fig. 2 to --23--.

Approval and entry of these replacement formal drawings are respectfully requested.